

The Cost-Effectiveness of Group Cognitive Behavioral Therapy Compared with Routine Primary Care for Women with Postnatal Depression in the UK

Matt D. Stevenson, PhD,¹ Alison Scope, PhD,¹ Paul A. Sutcliffe, DPhil²

¹School of Health and Related Research, University of Sheffield, Sheffield, UK; ²Warwick Medical School, University of Warwick, Warwick, UK

ABSTRACT

Objective: To assess the cost-effectiveness of group cognitive behavior therapy (gCBT) in comparison with routine primary care for women with postnatal depression in the UK.

Methods: Our analysis was based on a systematic literature review of the relative clinical effectiveness of gCBT compared with routine primary care and further reviews, supplemented with expert opinion of the likely cost of providing gCBT and the duration of comparative advantage for gCBT. Raw data were used to estimate a statistical relationship between changes in the Edinburgh Postnatal Depression Score (EPDS) values and changes in short-form six dimensions' (SF-6D) values. A mathematical model was constructed, and probabilistic sensitivity analyses were undertaken to estimate the mean cost per quality-adjusted life-year (QALY) and to evaluate the expected value of perfect information (EVPI).

Results: The mean cost per QALY from the stochastic analysis was estimated to be £36,062; however, there was considerable uncertainty around this value. The EVPI was estimated to be greater than £64 million; the key uncertainties were in the cost per woman of providing treatment and in the statistical relationship between changes in EPDS values and changes in SF-6D values. The expected value of perfect partial information for both of these parameters was in excess of £25 million.

Conclusions: Given the current information, the use of gCBT does not appear to be cost-effective; however, this decision is uncertain. The value of information analyses conducted indicates that further research to provide robust information on key parameters is needed and appears justified in cost-effective terms.

Keywords: cognitive behavior therapy, mathematical modeling, postnatal depression, value of information.

Introduction

The term "postnatal depression" (PND) has been used to describe a wide range of distressing symptoms after childbirth. This has led some clinicians to describe women as suffering from PND on the basis of the symptom of lowered or depressed mood [1]. It is more common, however, for a clinical diagnosis to be made based on the pattern and severity of symptoms. PND is also referred to as puerperal depression, postpartum depression, and perinatal depression, and is defined as a nonpsychotic depressive episode meeting standardized diagnostic criteria for a minor or major depressive disorder, beginning in or extending into the postnatal period, which is usually defined as up to 12 months postpartum [2].

Current criteria for the measurement of depression are provided in two major international classifications (International Classification of Diseases-10 [3] and Diagnostic and Statistical Manual of Mental Disorders-IV [4]). In addition to, or as an alternative to, these diagnostic criteria, self-report scales such as the Edinburgh Postnatal Depression Scale (EPDS) are used to identify PND and are widely used [5]. The EPDS scale consists of 10 Likert-format items relating to depression symptomology and has also been shown to measure anxiety symptomology [6]. Items are scored on a 0–3 scale and provide a range for the total score of between 0 and 30. Total scores within the range 12–30 suggest significant depression [7]. The EPDS has been shown to have reasonably good validity with a sensitivity of 86% and a

specificity of 78% in detecting women with research diagnostic criteria for depression [6].

There is substantial evidence to support the use of cognitive behavioral therapy (CBT) at an individual level for the treatment of depression [8], and psychological treatments are recommended by the National Institute for Health and Clinical Excellence (NICE) for PND [9]. Nevertheless, access is limited due to expense, waiting lists, and availability of therapists. Group CBT (gCBT) may offer a solution by reducing the contact time between therapists and increasing the number of available places for treatment. In 2003, there was an estimated number of 695,500 births per annum [10]; assuming that 17.3% of women have an EPDS score of 12 or over [11], this would equate to an estimated 120,000 women suffering from PND per annum. With costs of individual CBT estimated to be £1700 [12], the costs of treating all women suspected of having PND would be in the region of £200 million. Our objective was to assess the cost-effectiveness of providing gCBT rather than routine primary care (RPC) for women with PND in the UK in line with the NICE reference case [13]. As such, a National Health Service and personal social services approach was used.

Methods

A group of clinical advisors were convened to provide guidance and consisted of professors of psychology, applied psychological therapies, primary medical care, clinical psychology, and psychological medicine, and a consultant cognitive behavioral psychotherapist, psychiatrist, and a service user.

A systematic review of the clinical efficacy of gCBT was undertaken and is reported in detail elsewhere [12]. Only one study [14], a randomized controlled trial (RCT), was deemed applicable to the decision problem. This small RCT (n = 45) was

Address correspondence to: Matt Stevenson, Health Economics and Decision Science, School of Health and Related Research, University of Sheffield, 30 Regent Street, Sheffield S1 4DA, UK. E-mail: m.d.stevenson@shef.ac.uk

10.1111/j.1524-4733.2010.00720.x

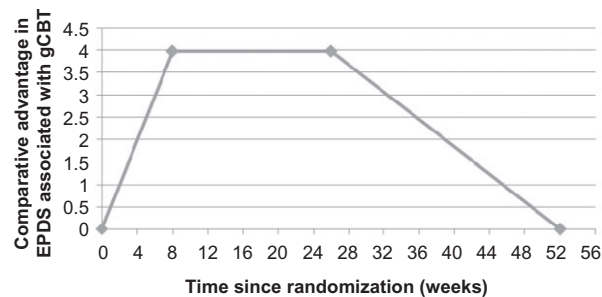


Figure 1 The conceptual model regarding the efficacy of group cognitive behavior therapy (gCBT) compared with routine primary care (RPC).

UK based, had a clear CBT component in the psycho-educational treatment intervention arm, and reported data on EPDS at baseline, end of treatment (8 weeks), and at a 6-month follow-up. Women, who were suspected of having PND based on the EPDS, attended one session per week for 8 weeks, which was of 2-hour duration and was held in groups of four to six women. The comparative gain (i.e., reduction) in EPDS values for gCBT compared with RPC was 3.48 (95% CI 0.23–6.73) at the end of treatment period (8 weeks) and 4.48 (95% CI 1.01–7.95) at 6-month follow-up. Based on clinical advice, it was assumed in the base-case that the comparative gain in EPDS of gCBT compared with RPC would rise linearly to a peak value at 8 weeks, stay constant until 6 months, and then decline linearly to zero 12 months after randomization (Fig. 1). The duration of comparative advantage was assumed to be 12 months as this was when symptoms of depression were no longer assumed to be postnatal in origin [2]. Sensitivity analyses were used to assess the robustness of the results in relation to changes in the duration of comparative advantage. To estimate the effect of gCBT during the period of 8 weeks to 6 months, the two data sets from the relevant RCT [14] were pooled; the benefits associated with the reduction in the confidence intervals were assumed to outweigh the loss of any (unreported) correlation between the separate time points. The pooled comparative advantage in EPDS was estimated to be 3.98 (95% CI 3.27–4.69).

In order that the effectiveness could be measured in terms of quality-adjusted life-years (QALYs), a mapping from EPDS to a utility score was required. Raw data were obtained from the authors of the PoNDER trial [11], which consisted of paired values for both EPDS and the short-form six dimensions (SF-6D), a utility measure [15]. Data were analyzed from 401 women with an EPDS score of 12 or greater at 6 weeks after childbirth, which had completed both the EPDS and the SF-6D questionnaire at both 6 weeks and 6 months. Figure 2 provides a plot of the change in EPDS value against change in SF-6D value. A moderate relationship was observed ($R^2 = 0.27$) that indicated that as the EPDS score improved (i.e., became lower), the SF-6D score improved (i.e., became higher). It is also noted that, regardless of any change in EPDS score, the utility of a woman was 0.0625 higher at 6 months compared with 6 weeks. This is most likely to be explained by the fact that the women would be expected to achieve more hours of sleep at 6 months than at 6 weeks, which would be accounted for in the SF-6D but not within the EPDS as it does not include a sleep component. A plot of residuals (not provided) showed no marked bias in the regression fit. Tests for heteroskedasticity indicated that the variance was not constant ($P = 0.008$), and thus, for probabilistic sensitivity analyses (PSA), robust errors were sampled from the regression. The QALYs obtained through gCBT treatment could thus be estimated by

transforming the gain in EPDS into utility values and then multiplying each gain by the appropriate time period.

The costs of providing gCBT were estimated from the resources reported in the RCT [14] (£1317) and from an assessment made by a group of experts regarding the likely resources required (£1246); derivation of these values are provided in detail elsewhere [12]. With associated sundry costs that may be expected, a cost of £1500 per woman treated was assumed in the base-case.

The cost-effectiveness of gCBT compared with RPC was estimated under a number of scenarios. These were a base-case analysis using fixed values for cost per woman of providing treatment and for the duration of comparative efficacy, but stochastic values for assumed efficacy and the transformation into SF-6D values; a series of sensitivity analyses showing the impact of changing variables; and a full PSA using 1000 parameter configurations. For the PSA evaluation, distributions were fitted to those uncertain variables where data were not robust. A triangular distribution was assumed for the cost per woman of providing treatment with a minimum of £750, a maximum of £2000, and a mode of £1500. This distribution allowed the cost to reduce were economies of scale to be achieved with widespread use, but to increase were fewer women willing to participate per class. A triangular distribution was also used for the comparative advantage of gCBT compared with RPC. A minimum duration of 1 year was assumed with a maximum of 2 years and a mode of 1 year, which incorporated the possibility that the beneficial effects of gCBT may persist beyond 12 months. These distributions were not viewed as unreasonable by our clinical experts. The mean values were a cost per woman of £1418 and duration of comparative advantage of 16 months, whereas these values differed from the deterministic, most likely, values (£1500 and 12 months, respectively). Nevertheless, the clinicians did not feel uncomfortable with this discrepancy as the distributions were likely to be skewed. It is acknowledged that the results from the PSA would be more favorable to gCBT treatment than the deterministic result but that the PSA answers provided a more realistic assessment of the cost-effectiveness of the intervention.

Cholesky decomposition techniques [16] were used to ensure that the slope and constant within the transformation of changes in the EPDS values to changes in SF-6D values were consistent with the raw data. Due to the small time horizon of the model, neither benefits nor costs were discounted.

The PSA facilitated expected value of information analyses, which estimated the expected value of perfect information (EVPI)

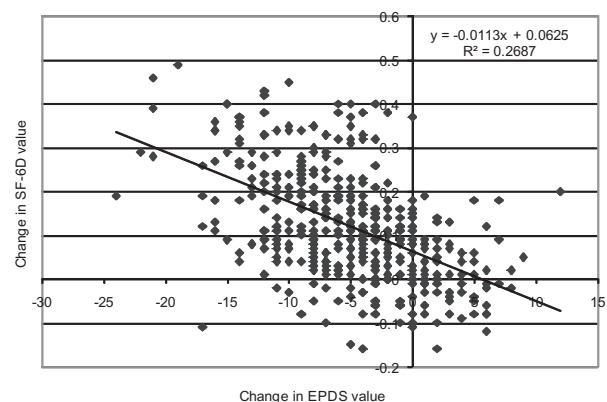


Figure 2 A regression of change in short-form six dimensions (SF-6D) against change in Edinburgh Postnatal Depression Score (EPDS).

Table 1 The results from the series of sensitivity analyses

Sensitivity analysis	Mean cost per woman (£)	Mean QALY gain per woman	Mean cost per QALY (£)
Base-case	1,500	0.032	46,462
Cost per woman decreased to £750	750	0.032	23,231
Cost per woman increased to £2,000	2,000	0.032	61,948
Lower 95% of efficacy assumed (EPDS decrease of 3.27)	1,500	0.027	56,626
Upper 95% of efficacy assumed (EPDS decrease of 4.69)	1,500	0.038	39,481
Linear decline in advantage extended to 18 months	1,500	0.044	34,382
Cost per woman decreased to £1000, EPDS decrease of 4.3 assumed, linear decline in advantage extended to 18 months	1,000	0.047	19,230

EPDS, Edinburgh Postnatal Depression Score; QALY, quality-adjusted life-year.

[17] and the expected value of perfect partial information (EVPI) [18]. EVPI provides the maximum expenditure a decision-maker would pay to remove all uncertainty in the decision problem; EVPI provides the maximum expenditure if all uncertainty was removed in one, or a subset, of parameters. In our analysis, we calculate the EVPI for the assumed advantage of gCBT compared with RPC in terms of EPDS, the cost of gCBT per woman treated, the duration of comparative advantage of gCBT, and the statistical relationship between EPDS and the SF-6D. For the value of information analyses, it was deemed that of the two thresholds reported by NICE [13], a threshold of £30,000 per QALY was more appropriate than a threshold of £20,000 as potential QALY impacts on the child that have been previously reported [19–21] were not incorporated within the model because of the lack of appropriate data, and therefore, there were “strong reasons to indicate that the assessment of the change in HRQL has been inadequately captured, and may therefore misrepresent the health utility gained” [13].

Results

In the base-case scenario, 0.032 QALYs were provided at a cost of £1500, resulting in a cost per QALY of £46,462. The results from the series of sensitivity analyses are provided in Table 1. It is seen that the cost per QALY is labile and that there will be plausible scenarios that have a cost per QALY ratio below £30,000 and also below £20,000, the lower of the two commonly reported thresholds for cost-effectiveness [13].

The results obtained from the base-case and the full PSA cannot be directly compared because of the means of the cost per woman treated and the comparative advantage being different to those in the deterministic base-case. The PSA incorporating stochastic values for costs estimated that an additional 0.039 QALYs would be provided at a cost of £1418, resulting in a cost per QALY of £36,062. The cost-effectiveness acceptability curve is shown in Figure 3.

The EVPI value was estimated to be £53.50 per woman receiving gCBT. As previously detailed, an estimated 120,000 women have PND per annum. If it was hypothesized that gCBT may be the most appropriate treatment for the forthcoming 10 years, then this would equate to 1,200,000 women who would be estimated to benefit from increased knowledge regarding the efficacy, cost, and duration of comparative advantage of gCBT compared with RPC. Combining the number of women who could benefit with the EVPI per woman indicates that decision-makers would be willing to pay a maximum of £64 million to remove all uncertainty in the decision problem. This amount appears more than sufficient to adequately fund additional research to assess the value of the uncertain parameters.

The EVPI analyses showed that two parameters contributed considerably to the uncertainty in whether gCBT was cost-

effective compared with RPC (Fig. 4). These were the cost of providing gCBT per woman treated and the relationship between EPDS values and SF-6D values. Nevertheless, even those variables with a lesser impact would still have EVPI values in excess of £500,000 when the number of women likely to benefit from the greater knowledge is considered.

Discussion

The current work provides the first published estimate of the cost-effectiveness of gCBT for PND in the UK. The base-case cost per QALY (£46,462) and the value from the full PSA (£36,062) are relatively high compared with currently used thresholds [13].

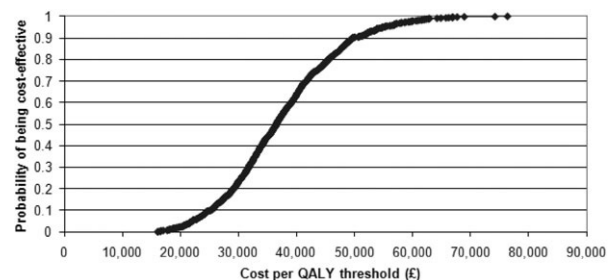


Figure 3 The cost-effectiveness acceptability curve for group cognitive behavior therapy compared with routine primary care having fitted statistical distributions to uncertain parameters. QALY, quality-adjusted life-year.

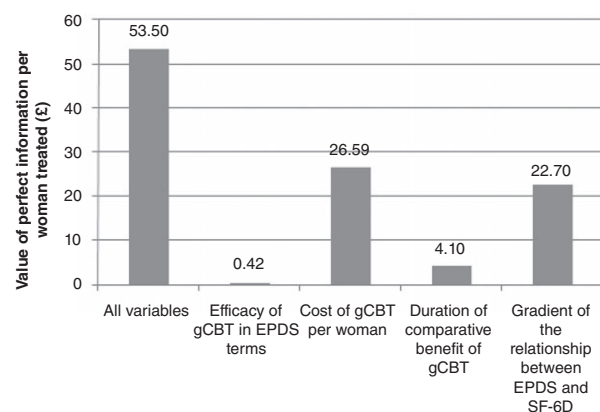


Figure 4 The value of perfect information associated with parameters in the model. EPDS, Edinburgh Postnatal Depression Score; gCBT, group cognitive behavior therapy; SF-6D, short-form six dimensions.

Nevertheless, there is considerable uncertainty in the model parameters. EVPI analyses indicate that the potential gain in ensuring the correct decision could be valued as high as £64 million, which would sufficiently cover the costs of undertaking further research to obtain more robust data even if there is inaccuracy in some of the fitted distributions.

Limitations within our work include the fact that no data were available comparing gCBT with CBT provided on an individual basis, which should be included as an appropriate comparator. It is strongly recommended that any future RCTs incorporating gCBT should also include an arm assessing the efficacy of individual CBT. Additionally, the implications in terms of effectiveness and cost of women wishing to move from individual to group treatment and vice versa should be assessed. The level of confounding within the main RCT used in our analyses due to the level of concurrent medication was also unknown; antidepressant use was included as a covariate within the analyses, but it is unclear whether the medication was identical. Any future research should explicitly control for concurrent medication.

Only one RCT was used to populate the efficacy data for gCBT. Given that both the number of participants and the number of clinicians involved were small, there is a possibility that the results are strongly influenced by the therapist. Additionally, as studies from countries outside the UK were not considered appropriate because of marked differences in the number of participants per class [22], it is unclear whether our results are generalizable to other countries.

The lack of perfect sensitivity and specificity of the EPDS in identifying women with PND will mean that some women are incorrectly diagnosed. Nevertheless, this is unlikely to alter our conclusions as the estimated gain in utility was calculated from a study collecting paired data for EPDS and SF-6D, which would incorporate some women with an EPDS of 12 or greater that did not have PND. Additional analyses were undertaken assuming a cut point of 8 on the EPDS as this threshold is reported to increase the sensitivity to over 90% [6]. Analysis of the 942 women in the PoNDER data set with an EPDS score of 8 or greater resulted in the same relationship between changes in EPDS and changes in SF-6D as that observed in women with an EPDS score of 12 or more ($n = 401$), namely, that each point decrease in EPDS was associated with an increase of 0.0113 in the SF-6D. Thus, the cost-effectiveness when offering treatment to women with an EPDS score of 8 or more is likely to be similar to that for treating women with an EPDS score of 12 or more. Nevertheless, due to the larger numbers involved, the value of information, which is already large, would approximately double (a multiplication factor of $942/401$) if it were women with an EPDS of 8 or greater offered treatment.

It is recommended that any future RCT should be larger in size, incorporate an individual CBT arm, explicitly control for concurrent medication, and attempt to evaluate the quality of life for women at 1-year post-randomization preferably directly with a utility measure such as the SF-6D to obviate the need for transforming between scales.

There is also considerable uncertainty in the costs of treating women with gCBT, which may benefit from economies of scale. It is therefore recommended that any future research explicitly calculate the cost per woman of gCBT, preferably from the later period of a large trial in order that any setup costs do not unduly bias this value.

Conclusion

Our exploratory analyses indicate that based on current data, gCBT is unlikely to be more cost-effective than RPC; however,

there is considerable uncertainty in the decision which is primarily due to lack of robust data on the costs of providing gCBT and on the relationship between changes in EPDS values and changes in SF-6D values. Research to reduce the uncertainty in these parameters is needed to ascertain if gCBT is a cost-effective intervention. The value of information analyses conducted indicates that the benefits associated with prospective data collection more than cover the costs of the further research recommended.

We acknowledge Jane Morrell and the PoNDER team for permission to use the data that allowed a relationship between SF-6D and EPDS to be established. This project was funded by the National Institute for Health Research Health Technology Assessment Programme (project number 06/83/01) and will be published in full in Health Technology Assessment (see the HTA Programme Web site for further project information). The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the Department of Health.

Source of financial support: Financial support was provided by the National Institute for Health Research.

References

- 1 Milgrom J, Martin PR, Negri LM. Treating Postnatal Depression. A Psychological Approach for Health Care Practitioners. England: Wiley, 1999.
- 2 Cox JL, Murray D, Chapman G. A controlled study of the onset, duration and prevalence of postnatal depression. *Br J Psychiatry* 1993;163:27–31.
- 3 World Health Organization. Tenth revision of the international classification of diseases and related health problems. Clinical descriptions and diagnostic guidelines, 1992.
- 4 American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (4th ed.). New York: American Psychiatric Association, 1994.
- 5 O'Hara MW. Postpartum depression: identification and measurement in a cross cultural context. In: Cox J, Holden J, eds. Perinatal Psychiatry Use and Misuse of the Edinburgh Postnatal Depression Scale. London: Gaskell, 1994.
- 6 Jomeen J, Martin C. Confirmation of an occluded anxiety component within the Edinburgh Postnatal Depression Scale (EPDS) during early pregnancy. *J Reprod Infant Psychol* 2005;23:143–54.
- 7 Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987;150:782–6.
- 8 Department of Health. Treatment choice in psychological therapies and counselling. Evidence based clinical practice guideline, 2001.
- 9 National Collaborating Centre for Mental Health. Antenatal and Postnatal Mental Health, 2007. Available at: <http://www.nice.org.uk/nicemedia/pdf/CG45fullguideline.pdf> [Accessed March 15, 2010].
- 10 Office for National Statistics. People & migration—archived in Dec 2005. Available from: <http://www.statistics.gov.uk/cc/nugget.asp?id=761> [Accessed March 15, 2010].
- 11 Morrell CJ, Warner R, Slade P, et al. Psychological interventions for postnatal depression: cluster randomised trial and economic evaluation. *The PoNDER trial. Health Technol Assess* 2009;13: 1–153.
- 12 Stevenson MD, Scope A, Sutcliffe PA, et al. Group cognitive-behavioural therapy for postnatal depression: a systematic review of clinical and cost effectiveness and value of information analyses. *Health Technol Assess* 2010;in press.
- 13 National Institute for Health and Clinical Excellence. Guide to the methods of technology appraisals. 2008. Available from: <http://www.nice.org.uk/media/B52/A7/TAMethodsGuideUpdatedJune2008.pdf> [Accessed March 15, 2010].
- 14 Honey KLB. A brief psycho-educational group intervention for postnatal depression. *Br J Clin Psychol* 2002;41:405–9.

- 15 Brazier JE, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. *J Health Econ* 2002; 21:271–92.
- 16 Briggs A, Claxton K, Sculpher M. *Decision Modelling for Health Economic Evaluation*. Oxford: Oxford University Press, 2006.
- 17 Claxton K, Posnett J. An economic approach to clinical trial design and research priority-setting. *Health Econ* 1996;5:513–24.
- 18 Felli JC, Hazen GB. Sensitivity analysis and the expected value of perfect information. *Med Decis Making* 1998;18:95–109.
- 19 Hay D, Pawlby S, Sharp D, et al. Intellectual problems shown by 11-year-old children whose mothers had postnatal depression. *J Child Psychol Psychiatry* 2001;42:871–89.
- 20 Carter A, Garrity R, Chazan C, et al. Maternal depression and comorbidity: predicting early parenting, attachment security, and toddler social-emotional problems and competencies. *J Am Acad Child Adolesc Psychiatry* 2001;40:18–26.
- 21 Campbell SB, Cohn JF, Meyers T. Depression in first-time mothers—mother-infant interaction and depression chronicity. *Dev Psychol* 1995;31:349–57.
- 22 Rojas G, Fritsch R, Solis J, et al. Treatment of postnatal depression in low-income mothers in primary-care clinics in Santiago, Chile: a randomised controlled trial. *Lancet* 2007;370:1629–37.